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EXAMINER
VINH, LAN

ART UNIT	PAPER NUMBER
1765	

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Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application N .	Applicant(s)	
	09/924,605	LINDSTROM ET AL.	
	Examiner	Art Unit	
	Lan Vinh	1765	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *09 August 2001* .

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-35* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-35* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

11)☐ The proposed drawing correction filed on _____ is: a)☐ approved b)☐ disapproved by the Examiner.

If approved, corrected drawings are required in reply to this Office action.

12)☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

13)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____ .

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

14)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).

a) ☐ The translation of the foreign language provisional application has been received.

15)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____ .
4) ☐ Interview Summary (PTO-413) Paper No(s). _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: .

DETAILED ACTION

Specification

1. In line 1 on page 10 of the specification, "nitorgen" appears to be a typographical error, the examiner suggests replacing "nitorgen" with—nitrogen—

Claim Objections

2. In line 3 of claim 13, "nitide" appears to be a typographical error, the examiner suggests replacing "nitide" with--nitride--. Correction is required.

In line 8 of claim 35, "said nitride layer gradual" appears to be redundant claim language, the examiner suggests deleting "said nitride layer gradual" in order to clarify the claim language.

Claim Rejections - 35 USC § 112

3. The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

4. Claims 1, 2, 11, 12, 13, 23, 26, 32, 33, 35 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claims 1, 2, 11, 12, 13, 23, 26, 32, 33 are indefinite for use of improper Markush language. The examiner suggests replacing "chosen from the group comprising" and "from the group comprising" with --selected from the group consisting of--

In line 5 of claim 35, "a step like manner" is vague and indefinite since the term "a step like manner" has not been defined in the specification.

Claim Rejections - 35 USC § 102

5. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.
> (e) the invention was described in-
> (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effect under this subsection of a national application published under section 122(b) only if the international application designating the United States was published under Article 21(2)(a) of such treaty in the English language; or
> (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that a patent shall not be deemed filed in the United States for the purposes of this subsection based on the filing of an international application filed under the treaty defined in section 351(a).

6. Claims 1-2, 9 are rejected under 35 U.S.C. 102(b) as being anticipated by Chakrabarti et al (US 5,668,049)

Chakrabarti discloses a method of making GaAs laser comprising facet coating with a protective layer. This method comprises the steps of:

cleaving the crystal facets in a non-vacuum atmosphere (col 2, lines 38-40) reads on cleaving out the crystal facets exposed to an ambient atmosphere containing air

plasma etching/dry etching the facets in vacuum (2mTorr) to remove native oxide and contamination from the facets (col 3, lines 16-21)

after removing the native oxide by plasma/dry etching, growing a nitride/native nitride layer on the facets by exposing/treating the facets in ECR CVD plasma containing nitrogen (col 3, lines 28-33)

Regarding claims 2, 9, Chakrabarti discloses that the hydrogen in the plasma removes the native oxide (col 3, lines 20-21), growing a nitride/native nitride layer on the facets to passivate the facets by exposing/treating the facets in ECR CVD plasma containing nitrogen/nitrogen assisted plasma (col 3, lines 30-33)

7. Claim 35 is rejected under 35 U.S.C. 102(e) as being anticipated by Sugiura et al (US 6204,084)

Sugiura discloses a method for manufacturing laser facet having GaAlN/InGaAs layers after the facets undergo organic cleaning. This method comprises the steps of:

adding nitrogen gas to a main carrier gas of hydrogen/argon in a plasma, gradually switching the main carrier gas from hydrogen/argon to nitrogen, the supply of hydrogen/argon gas is stopped (col 21, lines 34-36; col 28, lines 38-40) reads on adding nitrogen gas to an argon plasma and gradually removing argon until only nitrogen plasma is provided. For the purpose of examination, "nitrogen plasma is provided in a step like manner", is best understood by the examiner, as nitrogen is gradually provided

forming/growing a nitride layer (GaN) 17 by supplying plasmatic nitrogen to react with the GaAlN/InGaAs layers 16, 18 (col 21, lines 28-30) reads on making use of native nitridisation since native nitridisation is defined as nitrogen plasma treatment of laser facet layers in page 14 of the specification, forming a contact/interface between

the cleaned/contamination free facets surface and the nitride layer (fig 3), fig. 3 also shows a uniform/gradual border line between layers 17, 16 and 18

Claim Rejections - 35 USC § 103

8. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

9. Claims 3-8, 10-12 rejected under 35 U.S.C. 103(a) as being unpatentable over Chakrabarti et al (US 5,668,049) in view of Sugiura et al (6,204,084)

Chakrabarti method has been described above in paragraph 6. Unlike the instant claimed inventions as per claims 3-8, Chakrabarti does not specifically disclose performing dry etching the facets with a plasma mixture of atomic nitrogen and another gas, said another gas is being replaced by nitrogen until only nitrogen plasma is provided.

However, Sugiura discloses a method for manufacturing laser facet having GaAlN layer comprises the step of dry etching the facet with a plasma mixture of nitrogen atoms and another gas, the another gas is being replaced by nitrogen until only nitrogen plasma is provided (col 20, lines 49-53; col 21, lines 29-40)

Hence, one skilled in the art would have found it obvious to modify Chakrabarti method by the step of dry etching the facet with a plasma mixture of nitrogen atoms and

another gas as per Sugiura because Suguira states that when only active nitrogen atoms is provided in the plasma the nitrogen vacancy density in the laser facet structure can be reduced and there is merit in which production costs can be much decreased (col 21, lines 60-67)

Regarding claim 10, since both hydrogen and argon are known inert gases in the art, one skilled in the art would have found it obvious to substitute the hydrogen gas in Chakrabarti dry etching step with argon because hydrogen and argon are equivalent inert gas, thus the substitution of one for the other would have achieved the expected results.

Regarding claim 12, Chakrabarti discloses cleaving the facets to form GaAs layer, growing a nitride layer onto the surface of the facets by treating the facets in ECR CVD plasma containing ionic nitrogen to make an interface between the facet and the nitride layer (col 3, lines 30-33; fig. 1)

10. Claims 13-16 are rejected under 35 U.S.C. 103(a) as being unpatentable over Chakrabarti et al (US 5,668,049) in view of Horie et al (6,323,052)

Chakrabarti method has been described above in paragraph 6. Unlike the instant claimed inventions as per claims 13-15, Chakrabarti does not specifically disclose creating the additional nitride layer GaN using plasma comprising nitrogen with an extracted beam.

Horie discloses a method for fabricating laser facet comprises the step of forming additional nitride layer of GaN, InGaAs using plasma comprising nitrogen with an extracted beam (col 28, lines 65-67)

Hence, one skilled in the art would have found it obvious to modify Chakrabarti method by forming the additional nitride layer GaN to provide a buffer layer to relieve the insufficient in the substrate bulk crystal as taught by Horie (col 10, lines 62-64)

Unlike the instant claimed inventions as per claim 16, Chakrabarti does not specifically disclose dry etching the facet at specific energy range of 0-2000 eV in combination with beam angle from $0\text{-}90^0$.

Horie also discloses dry etching the facet at specific energy range of 1000 eV in combination with beam angle 10^0 (col 10, lines 53-54;col 22, lines 42-43)

Hence, one skilled in the art would have found it obvious to modify Chakrabarti method by dry etching the facet at specific energy range in combination with beam angle as per Horie to broaden the band gap in the vicinities of the facet and that the facet is transparent to the emission length (col 22, lines 52-55)

11. For the purpose of examination, it is known that ion milling is defined as argon or nitrogen plasma treatment in page 12 of the specification.

12. Claims 17-25 are rejected under 35 U.S.C. 103(a) as being unpatentable over Horie et al (US 6,323,052) in view of Belouet et al (5,780,120)

Horie discloses a method for fabricating laser facet. This method comprises the steps of:

cleaving the crystal facets under atmospheric pressure (col 32, lines 14-15) reads on cleaving out the crystal facets exposed to an ambient atmosphere containing air

irradiating the facets with Ar plasma in vacuum to remove oxide and contamination after cleaving (col 16, lines 57-58 and col 32, lines 23-26) reads on making ion-milling in vacuum to remove contamination layer provided at the cleaving step

forming a nitride compound layer (SiN) on the front facet to prevent chemical contamination (col 17, lines 20-21), the band gap in the vicinities of the facet is broaden (col 22, lines 52-54) reads on the nitride compound have band-gap higher than their counter parts.

Unlike the instant claimed invention as per claim 17, Horie does not specifically discloses forming the nitride compound layer (SiN) by nitrogen ion-milling

However, Belouet discloses a method for preparing laser faces comprises the step of forming the nitride compound layer (SiN) by nitrogen plasma /nitrogen ion milling (col 2, lines 23-30)

Hence, one skilled in the art would have found it obvious to modify Horie method by forming the nitride compound layer by nitrogen plasma /nitrogen ion milling as per Belouet because Belouet states that atomic nitrogen under ECR plasma is easier to incorporate in the passivation layer (col 4, lines 24-26)

The limitation of claim 18 has been discussed above.

The limitation of claim 19 has been discussed above in paragraph 8.

Regarding claim 20, Horie discloses the step of growing a nitride layer on the facet of the laser bar (col 17, lines 20-30)

Regarding claim 22, Horie discloses dry etching the facet at specific energy range of 1000 eV in combination with beam angle 10^0 (col 10, lines 53-54;col 22, lines 42-43)

Regarding claims 23-25, Horie discloses forming additional nitride layer of GaN, InGaAs using plasma comprising nitrogen with an extracted beam (col 28, lines 65-67)

13. Claims 26-34 are rejected under 35 U.S.C. 103(a) as being unpatentable over Sugiura et al (US 6,204,084) in view of Belouet et al (5,780,120)

Sugiura discloses a method for manufacturing laser facet having GaAlN layer. This method comprises the steps of:

cleaving the laser into laser bar in atmospheric (col 20, lines 37-38), the laser bar having a first and second facet (fig. 18)

stacking the laser bars in a 2 dimensional multiplayer stack/matrix (col 21, lines 16-19; fig. 3)

placing the stacked laser bar/matrix in vacuum in the atmosphere of several Torr (col 22, lines 1-2) reads on placing the matrix in vacuum between 10 Torr and 10^{-11} Torr

removing the natural surface oxide and contamination from the facets using dry etching/ion beam etching using plasma containing hydrogen (col 12, lines 40-44)

forming a GaN layer 40/first nitride layer on the first and second facet (col 20, lines 48-51; fig. 17)

forming a second GaN layer 41/second nitride layer (col 20, lines 51-52)

forming a third GaN layer 55/third thin nitride layer using reactive plasma (col 21, lines 6-10)

forming/adding a passivation layer 74 before a protective /mirror coating (col 23, lines 42-44)

forming an upper/protective layer 64 (col 23, lines 29-30)

Unlike the instant claimed invention as per claim 26, Sugiura does not explicitly disclose forming a GaN layer 40/first nitride layer using ion beam plasma containing nitrogen.

However, Belouet discloses a method for preparing laser faces comprises the step of forming the nitride compound layer by nitrogen containing plasma /nitrogen ion milling (col 2, lines 23-30)

Hence, one skilled in the art would have found it obvious to modify Sugiura method by forming the nitride compound layer by nitrogen plasma /nitrogen ion milling as per Belouet because Belouet states that atomic nitrogen under ECR plasma is easier to incorporate in the passivation layer (col 4, lines 24-26)

Regarding claim 27, Sugiura discloses using acceleration energy of 200 keV (col 20, lines 1-2)

Regarding claim 28, Sugiura discloses performing a heating step at 1100^0 C/annealing step followed the cleaving step (col 20, lines 56-57)

Regarding claims 29-31, although Sugiura discloses dry etching using RIE method, Sugiura does not explicitly disclose supplying microwave power, RF power or DC power to excite the plasma. However, since it is known in the art of plasma etching that

microwave power, RF power or DC power supply may be used to create plasma in RIE method (see prior art of record for evidence of this basis), one skilled in the art would have found it obvious to employ microwave power, RF power or DC power supply to excite the gas in Sugiura RIE etching step to produce an expected result.

Regarding claims 32-33, Sugiura discloses using a mixture of nitrogen and hydrogen gases (col 17, lines 58-60)

The limitation of claim 34 has been discussed above.

14. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

Bhardwaj et al (US 6,261,962) discloses that microwave power, RF power or DC power supply may be used to create plasma in RIE method (col 4, lines 14-24)

Conclusion

15. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Lan Vinh whose telephone number is 703 305-6302. The examiner can normally be reached on M-F 8:30-5:30 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Benjamin Utech can be reached on 703 308-3836. The fax phone numbers for the organization where this application or proceeding is assigned are 703 872-9310 for regular communications and 703 872-9311 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703 308-0661.

BENJAMIN L. UTECH
SUPERVISORY PATENT EXAMINER
TECHNOLOGY CENTER 1700

LV
October 18, 2002